

AMSC N/A  
DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

1. SCOPE

1.1 Scope. This drawing documents the general requirements of a high performance octal buffer and line driver with three-state outputs microcircuit, with an operating temperature range of -55°C to +125°C for device type 01 and -40°C to +125°C for device type 02.

1.2 Vendor Item Drawing Administrative Control Number. The manufacturers PIN is the item of identification. The vendor item drawing establishes an administrative control number for identifying the item on the engineering documentation:

<u>V62/03607</u>	-	<u>01</u>	<u>X</u>	<u>E</u>
Drawing number		Device type (See 1.2.1)	Case outline (See 1.2.2)	Lead finish (See 1.2.3)

1.2.1 Device type(s).

<u>Device type</u>	<u>Generic</u>	<u>Circuit function</u>
01	74HC244-EP	Octal buffer and line driver with three-state outputs
02	74HC244-EP	Octal buffer and line driver with three-state outputs

1.2.2 Case outline(s). The case outlines shall be as specified herein.

<u>Outline letter</u>	<u>Number of pins</u>	<u>JEDEC PUB 95</u>	<u>Package style</u>
X	20	MS-013	Plastic small-outline package
Y	20	MO-153	Plastic small-outline package

1.2.3 Lead finishes. The lead finishes shall be as specified below or other lead finishes as provided by the device manufacture:

<u>Finish designator</u>	<u>Material</u>
A	Hot solder dip
B	Tin-lead plate
C	Gold plate
D	Palladium
E	Gold flash palladium

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/03607
		REV      A	PAGE      2

### 1.3 Absolute maximum ratings. 1/

Supply voltage range ( $V_{CC}$ )	-0.5 V to 7.0 V
Input clamp current ( $I_{IK}$ ) ( $V_I < 0$ or $V_I > V_{CC}$ )	$\pm 20$ mA 2/
Output clamp current ( $I_{OK}$ ) ( $V_O < 0$ or $V_O > V_{CC}$ )	$\pm 20$ mA 2/
Continuous output current ( $I_O$ ) ( $V_O = 0$ to $V_{CC}$ )	$\pm 35$ mA
Continuous current through $V_{CC}$ or GND	$\pm 70$ mA
Storage temperature range ( $T_{STG}$ )	-65°C to 150°C
Package thermal impedance ( $\theta_{JA}$ ): 3/	
X package	58°C/W
Y package	83°C/W

### 1.4 Recommended operating conditions. 4/

Supply voltage range ( $V_{CC}$ )	2.0 V to 6.0 V
Input voltage range ( $V_I$ )	0.0 V to $V_{CC}$
Output voltage range ( $V_O$ )	0.0 V to $V_{CC}$
Minimum high level input voltage ( $V_{IH}$ ):	
$V_{CC} = 2.0$ V	1.5 V
$V_{CC} = 4.5$ V	3.15 V
$V_{CC} = 6.0$ V	4.2 V
Minimum low level input voltage ( $V_{IL}$ ):	
$V_{CC} = 2.0$ V, 4.5 V, and 6.0 V	0.0 V
Maximum low level input voltage ( $V_{IL}$ ):	
$V_{CC} = 2.0$ V	0.5 V
$V_{CC} = 4.5$ V	1.35 V
$V_{CC} = 6.0$ V	1.8 V
Minimum input transition rise or fall time ( $t_i$ ):	
$V_{CC} = 2.0$ V, 4.5 V, and 6.0 V	0.0 ns
Maximum input transition rise or fall time ( $t_i$ ):	
$V_{CC} = 2.0$ V	1000 ns
$V_{CC} = 4.5$ V	500 ns
$V_{CC} = 6.0$ V	400 ns
Operating free-air temperature range ( $T_A$ ):	
Device type 01	-55°C to +125°C
Device type 02	-40°C to +125°C

## 2. APPLICABLE DOCUMENTS

JEDEC PUB 95	-	Registered and Standard Outlines for Semiconductor Devices
JEDEC STD 51-7	-	High Effective Thermal Conductivity Test Board for Leaded Surface Mount Packages

(Applications for copies should be addressed to the Electronic Industries Alliance, 2500 Wilson Boulevard, Arlington, VA 22201-3834 or at <http://www.jedec.org>).

- 1/ Stresses beyond those listed under "absolute maximum rating" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- 2/ The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
- 3/ The package thermal impedance is calculated in accordance with JESD 51-7.
- 4/ Use of this product beyond the manufacturers design rules or stated parameters is done at the user's risk. The manufacturer and/or distributor maintain no responsibility or liability for product used beyond the stated limits.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/03607</b>
		REV      A	PAGE      3

### 3. REQUIREMENTS

3.1 Marking. Parts shall be permanently and legibly marked with the manufacturer's part number as shown in 6.3 herein and as follows:

- A. Manufacturer's name, CAGE code, or logo
- B. Pin 1 identifier
- C. ESDS identification (optional)

3.2 Unit container. The unit container shall be marked with the manufacturer's part number and with items A and C (if applicable) above.

3.3 Electrical characteristics. The maximum and recommended operating conditions and electrical performance characteristics are as specified in 1.3, 1.4, and table I herein.

3.4 Design, construction, and physical dimensions. The design, construction, and physical dimensions are as specified herein.

3.5 Diagrams.

3.5.1 Case outline(s). The case outline(s) shall be as shown in 1.2.2 and figure 1.

3.5.2 Truth table. The truth table shall be as shown in figure 2.

3.5.3 Logic diagram. The logic diagram shall be as shown in figure 3.

3.5.4 Terminal connections. The terminal connections shall be as shown in figure 4.

3.5.5 Test circuit and timing waveforms. The test circuit and timing waveforms shall be as shown in figure 5.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/03607</b>
		REV      A	PAGE      4

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions	V <sub>CC</sub>	Temperature, T <sub>A</sub>	Device type	Limits		Unit
						Min	Max	
High level output voltage	V <sub>OH</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> <u>1/</u> I <sub>OH</sub> = -20 μA	2.0 V	<u>2/</u>	All	1.9		V
			4.5 V			4.4		
			6.0 V			5.9		
		V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> <u>1/</u> I <sub>OH</sub> = -6 mA	4.5 V	25°C		3.98		
				<u>3/</u>		3.7		
		V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> <u>1/</u> I <sub>OH</sub> = -7.8 mA	6.0 V	25°C		5.48		
				<u>3/</u>		5.2		
Low level output voltage	V <sub>OL</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> <u>1/</u> I <sub>OL</sub> = 20 μA	2.0 V	<u>2/</u>	All		0.1	V
			4.5 V				0.1	
			6.0 V				0.1	
		V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> <u>1/</u> I <sub>OL</sub> = 6 mA	4.5 V	25°C			0.26	
				<u>3/</u>			0.4	
		V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> <u>1/</u> I <sub>OL</sub> = 7.8 mA	6.0 V	25°C			0.26	
				<u>3/</u>			0.4	
Input current	I <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or 0 V	6.0 V	25°C	All		±0.1	μA
				<u>3/</u>			±1.0	
Three-state output leakage current	I <sub>OZ</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> <u>1/</u> V <sub>O</sub> = V <sub>CC</sub> or 0 V	6.0 V	25°C	All		±0.5	μA
				<u>3/</u>			±10.0	
Quiescent supply current	I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or 0 V I <sub>O</sub> = 0 A	6.0 V	25°C	All		8.0	μA
				<u>3/</u>			160.0	
Input capacitance	C <sub>I</sub>		2.0 V to 6.0 V	<u>2/</u>	All		10	pF
Power dissipation capacitance per buffer/driver	C <sub>PD</sub>	No load		25°C	All	35 typical		pF

See footnotes at end of table.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/03607</b>
		REV A	PAGE 5

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions	V <sub>CC</sub>	Temperature, T <sub>A</sub>	Device type	Limits		Unit
						Min	Max	
Propagation delay time, A to Y	t <sub>pd</sub>	C <sub>L</sub> = 50 pF See figure 5	2.0 V	25°C	All		115	ns
				<u>3</u> /			170	
			4.5 V	25°C			23	
				<u>3</u> /			34	
			6.0 V	25°C			20	
				<u>3</u> /			29	
		C <sub>L</sub> = 150 pF See figure 5	2.0 V	25°C			165	
				<u>3</u> /			245	
			4.5 V	25°C			33	
				<u>3</u> /			49	
			6.0 V	25°C			28	
				<u>3</u> /			42	
Propagation delay time, output enable, $\overline{\text{OE}}$ to Y	t <sub>en</sub>	C <sub>L</sub> = 50 pF See figure 5	2.0 V	25°C	All		150	ns
				<u>3</u> /			225	
			4.5 V	25°C			30	
				<u>3</u> /			45	
			6.0 V	25°C			26	
				<u>3</u> /			38	
		C <sub>L</sub> = 150 pF See figure 5	2.0 V	25°C			200	
				<u>3</u> /			300	
			4.5 V	25°C			40	
				<u>3</u> /			60	
			6.0 V	25°C			34	
				<u>3</u> /			51	

See footnotes at end of table.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/03607</b>
		<b>REV      A</b>	<b>PAGE      6</b>

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions	V <sub>CC</sub>	Temperature, T <sub>A</sub>	Device type	Limits		Unit
						Min	Max	
Propagation delay time, output disable, $\overline{\text{OE}}$ to Y	t <sub>dis</sub>	C <sub>L</sub> = 50 pF See figure 5	2.0 V	25°C	All		150	ns
				<u>3/</u>			225	
			4.5 V	25°C			30	
				<u>3/</u>			45	
			6.0 V	25°C			26	
				<u>3/</u>			38	
Output transition time	t <sub>t</sub>	C <sub>L</sub> = 50 pF See figure 5	2.0 V	25°C	All		60	ns
				<u>3/</u>			90	
			4.5 V	25°C			12	
				<u>3/</u>			18	
			6.0 V	25°C			10	
				<u>3/</u>			15	
		C <sub>L</sub> = 150 pF See figure 5	2.0 V	25°C			210	
				<u>3/</u>			315	
			4.5 V	25°C			42	
				<u>3/</u>			63	
			6.0 V	25°C			36	
				<u>3/</u>			53	

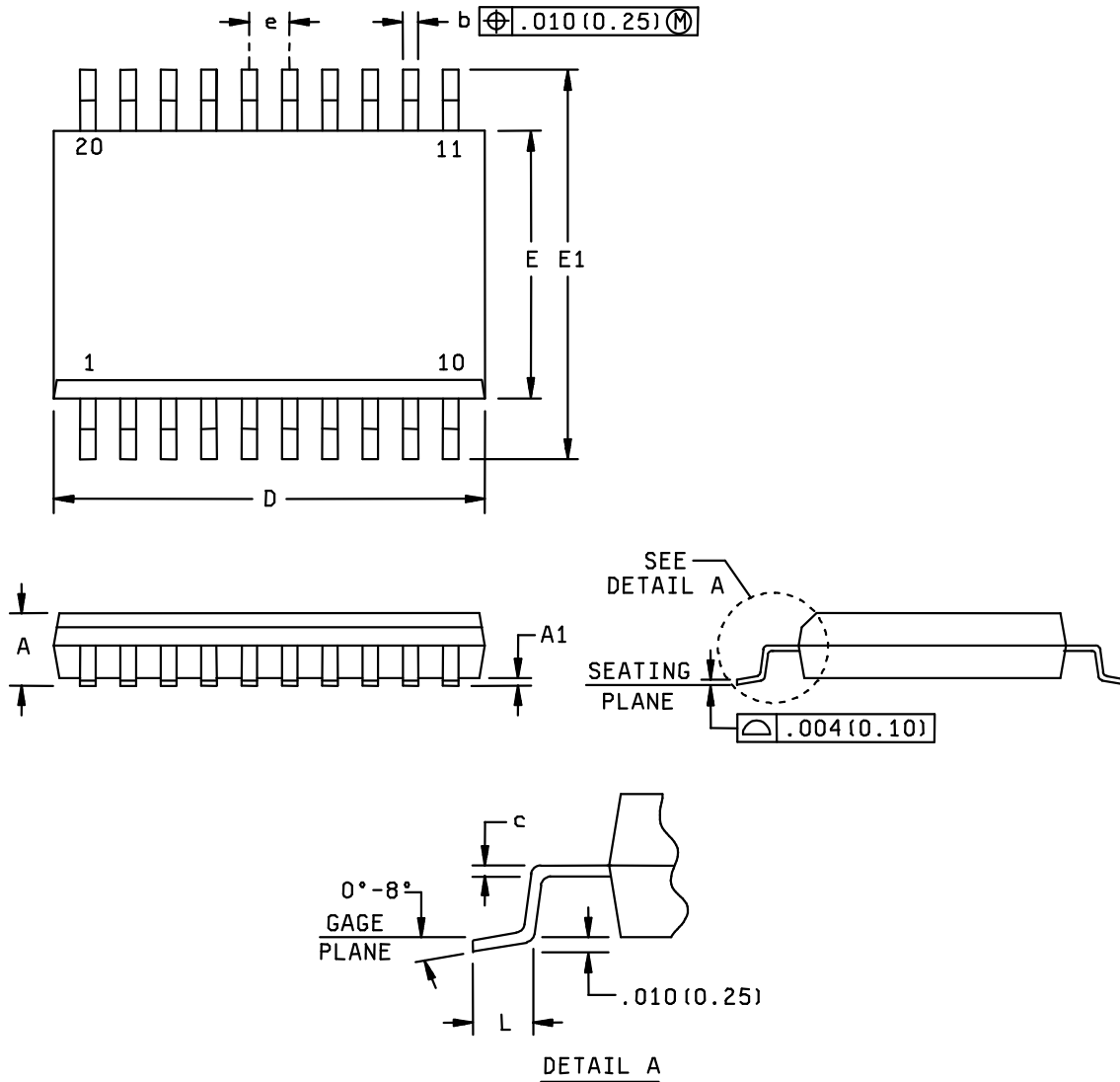
1/ The values to be used for V<sub>IH</sub> and V<sub>IL</sub> shall be the V<sub>IH</sub> minimum and V<sub>IL</sub> maximum values listed in section 1.4 herein.

2/ T<sub>A</sub> = 25°C, -55°C to 125°C for device type 01 ; T<sub>A</sub> = 25°C, -40°C to 125°C for device type 02.

3/ T<sub>A</sub> = -55°C to 125°C for device type 01 ; T<sub>A</sub> = -40°C to 125°C for device type 02.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/03607</b>
		<b>REV      A</b>	<b>PAGE      7</b>

# Case X



## NOTES:

1. All linear dimensions are in inches (millimeters).
2. This case outline is subject to change without notice.
3. Body dimensions do not include mold flash or protrusion, not to exceed .006 inches (0.15 millimeters).
4. Fall within JEDEC MS-013.

FIGURE 1. Case outlines.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/03607
		REV	PAGE 8

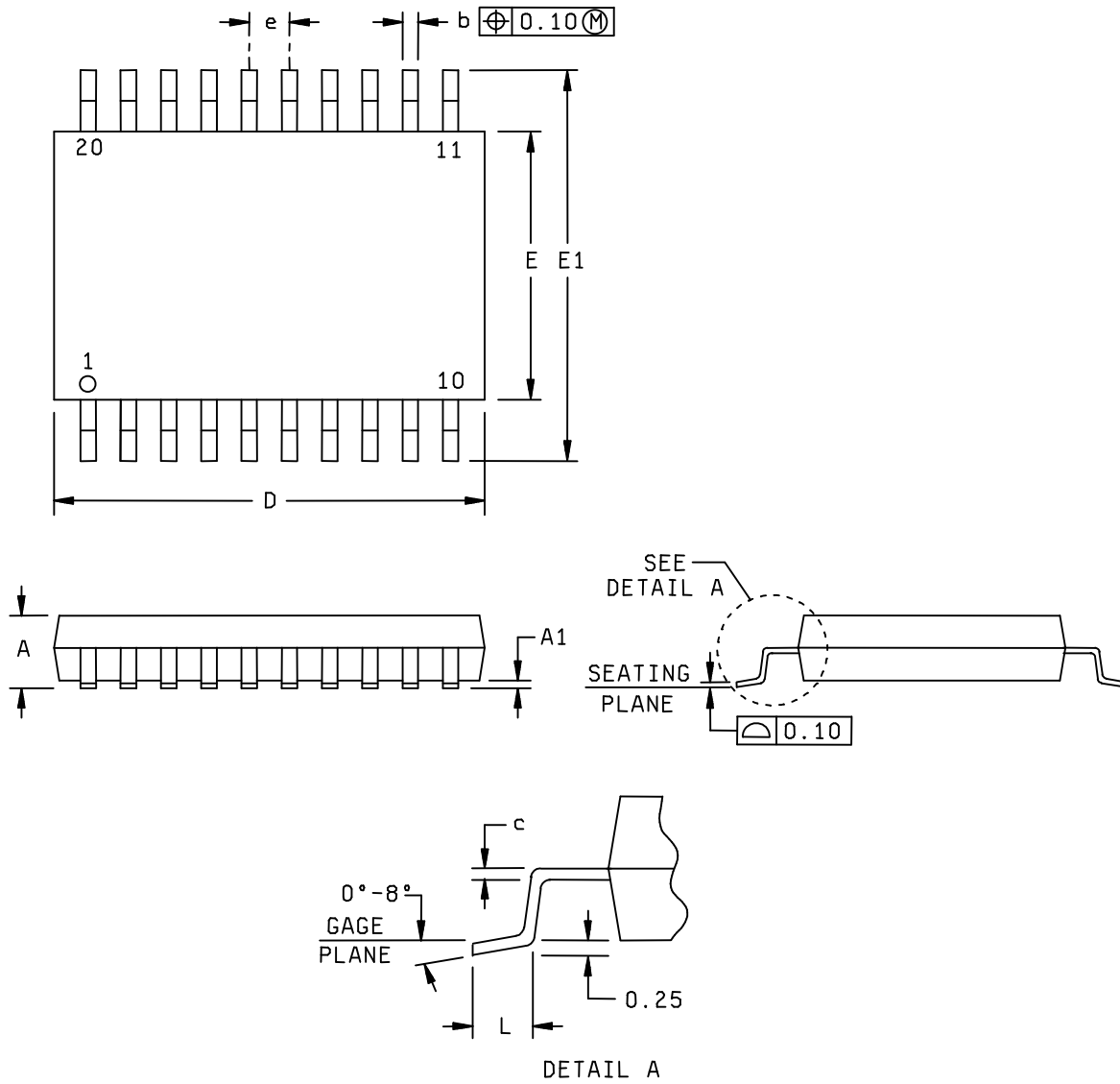
Case X - Continued

Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A		.104		2.65
A1	.004	.012	0.10	0.30
b	.014	.020	0.35	0.51
c	.010 NOM		0.25 NOM	
D	.500	.510	12.70	12.95
E	.291	.299	7.39	7.59
E1	.400	.419	10.15	10.65
e	.050 BSC		1.27 BSC	
L	.016	.050	0.40	1.27

FIGURE 1. Case outlines - Continued.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/03607</b>
		REV	PAGE 9

Case Y



NOTES:

1. All linear dimensions are in millimeters.
2. This case outline is subject to change without notice.
3. Body dimensions do not include mold flash or protrusion, not to exceed 0.15 millimeters.
4. Fall within JEDEC MO-153.

FIGURE 1. Case outlines - Continued.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE <b>A</b>	CODE IDENT NO. <b>16236</b>	DWG NO. <b>V62/03607</b>
		REV      A	PAGE      10

Case Y - Continued

Symbol	Dimensions	
	Millimeters	
	Min	Max
A		1.20
A1	0.05	0.15
b	0.19	0.30
c	0.15 NOM	
D	6.40	6.60
E	4.30	4.50
E1	6.20	6.60
e	0.65 BSC	
L	0.50	0.75

FIGURE 1. Case outlines - Continued.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/03607
		REV      A	PAGE      11

Each buffer/driver		
Inputs		Output
$\overline{\text{OE}}$	A	Y
L	H	H
L	L	L
H	X	Z

H = High voltage level  
 L = Low voltage level  
 Z = High impedance  
 X = Don't care

FIGURE 2. Truth table.

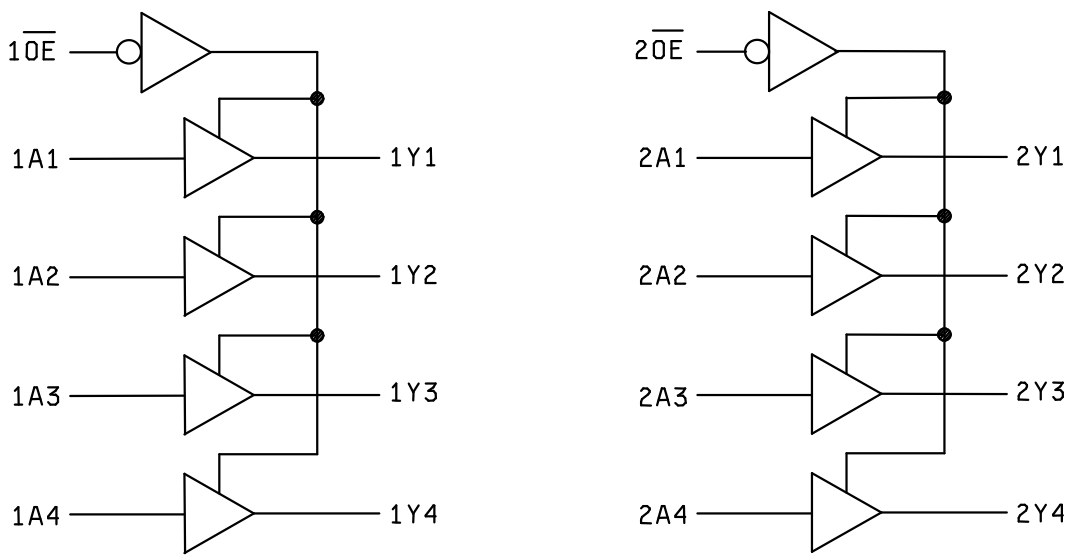


FIGURE 3. Logic diagram.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/03607
		REV      A	PAGE      12

Device type	All
Case outlines	X and Y
Terminal number	Terminal symbol
1	1 $\overline{OE}$
2	1A1
3	2Y4
4	1A2
5	2Y3
6	1A3
7	2Y2
8	1A4
9	2Y1
10	GND
11	2A1
12	1Y4
13	2A2
14	1Y3
15	2A3
16	1Y2
17	2A4
18	1Y1
19	2 $\overline{OE}$
20	V <sub>CC</sub>

FIGURE 4. Terminal connections.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/03607</b>
		REV      A	PAGE      13

PARAMETER		$R_L$	$C_L$	S1	S2
$t_{en}$	$t_{PZH}$	1 k $\Omega$	50 pF or 150 pF	OPEN	CLOSED
	$t_{PZL}$			CLOSED	OPEN
$t_{dis}$	$t_{PHZ}$	1 k $\Omega$	50 pF	OPEN	CLOSED
	$t_{PLZ}$			CLOSED	OPEN
$t_{pd}$ or $t_t$		—	50 pF or 150 pF	OPEN	OPEN

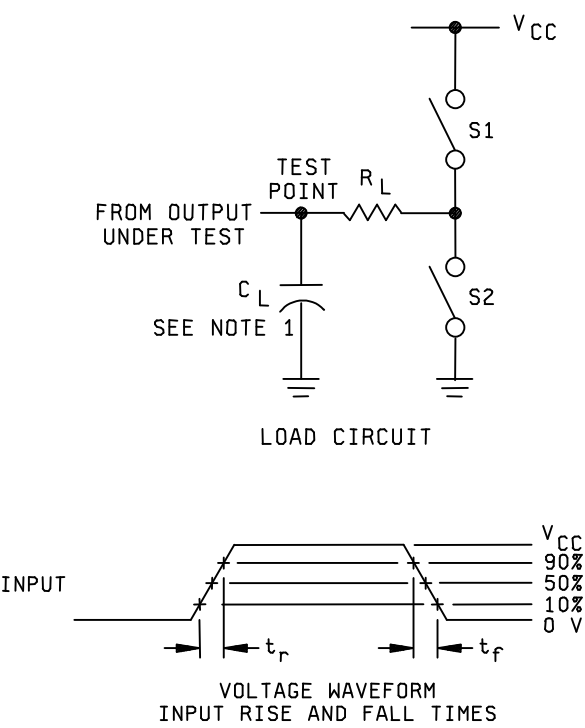
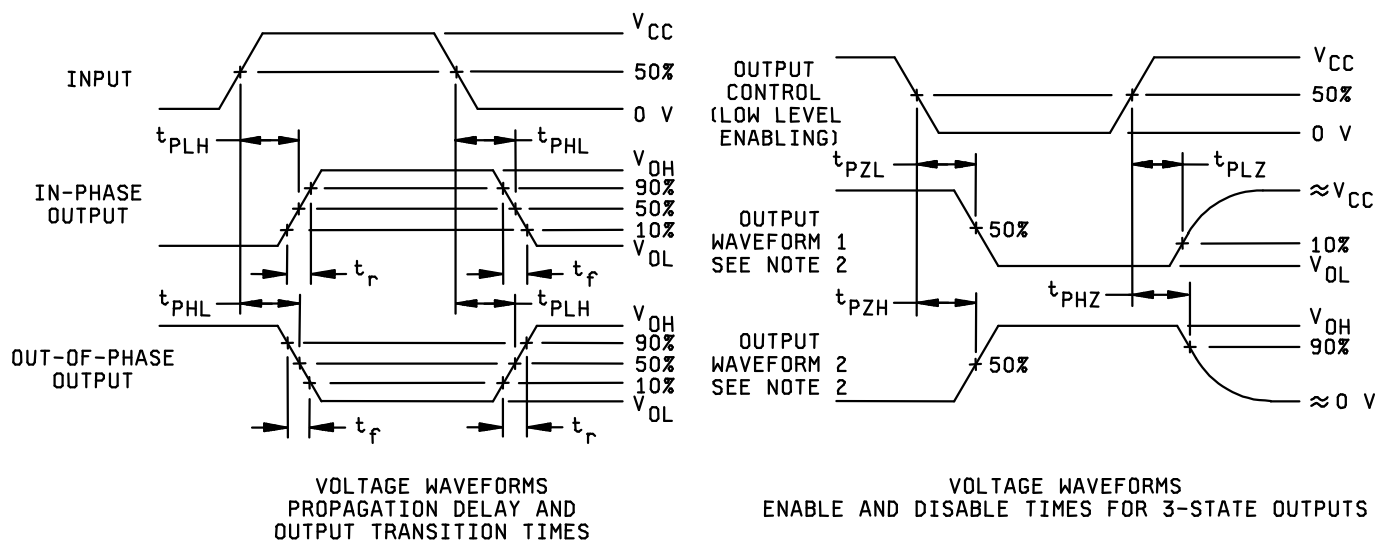


FIGURE 5. Test circuit and timing waveforms.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/03607
		REV      A	PAGE      14



NOTES:

1.  $C_L$  includes probe and test-fixture capacitance.
2. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
3. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r = 6 \text{ ns}$ ,  $t_f = 6 \text{ ns}$ .
4. The outputs are measured one at a time with one input transition per measurement.
5.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ ;  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ ;  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

FIGURE 5. Test circuit and timing waveforms - Continued.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/03607
		REV A	PAGE 15

#### 4.0 QUALITY ASSURANCE PROVISIONS

4.1 Product assurance requirements. The manufacturer is responsible for performing all inspection and test requirements as indicated in their internal documentation. Such procedures should include proper handling of electrostatic sensitive devices, classification, packaging, and labeling of moisture sensitive devices, as applicable.

#### 5.0 PREPARATION FOR DELIVERY

5.1 Packaging. Preservation, packaging, labeling, and marking shall be in accordance with the manufacturer's standard commercial practices for electrostatic discharge sensitive devices.

#### 6.0 NOTES

6.1 ESDS. Devices are electrostatic discharge sensitive and are classified as ESDS class 1 minimum.

6.2 Configuration control. The data contained herein is based on the salient characteristics of the device manufacturer's data book. The device manufacturer reserves the right to make changes without notice. This drawing will be modified as changes are provided.

6.3 Suggested source(s) of supply. Identification of the suggested source(s) of supply herein is not to be construed as a guarantee of present or continued availability as a source of supply for the item.

Vendor item drawing administrative control number <u>1/</u>	Device manufacturer CAGE code	Vendor part number	Top side marking
V62/03607-01XE	01295	SN74HC244MDWREP	HC244MEP
V62/03607-02XE	01295	SN74HC244QDWREP	SHC244EP
V62/03607-02YE	01295	SN74HC244QPWREP	SHC244EP

1/ The vendor item drawing establishes an administrative control number for identifying the item on the engineering documentation.

#### CAGE code

01295

#### Source of supply

Texas Instruments, Inc.  
Semiconductor Group  
8505 Forest Lane  
P.O. Box 660199  
Dallas, TX 75243  
Point of contact: U.S. Highway 75 South  
P.O. Box 84, M/S 853  
Sherman, TX 75090-9493

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/03607</b>
		<b>REV      A</b>	<b>PAGE      16</b>